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NOTES ON SPHEX ABERTI (HALD.)

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Dr. H. T. Fernald (4) gives as synonyms of *Sphex aberti* (Hald.)* the names *Ammophila yarrowi* Cress. and *A. montezuma* Cam. This species was one of the first of our wasps to which has been ascribed the remarkable habit of using a pebble or other suitable object as a tool. The observation was made by Dr. S. W. Williston (9) in 1892 on specimens determined as *A. yarrowi.* He considered the habit so unusual that he refrained publication for a time thinking the act might be doubted. It is now an accepted fact, though somewhat variously interpreted, and has been witnessed by a number of careful and accurate observers in this and other species.

Notes on an *Ammophila* sp. have been given by Kellogg (6), a species which according to Professor Fernald has later been determined *S. aberti.* Dr. Kellogg did not state this wasp to be a tool user, although he does refer to the records from Kansas and Wisconsin in other species.

The present writer has studied this species both in Colorado and in California. Interest and attention was particularly centered about the tool using habit in an attempt to obtain data concerning its possible origin and present significance. A more detailed consideration of the habit in this and other species will be presented in a later paper. It suffices to say, however, at this time, that the prolonged use of a pebble as a tool by the nesting females, *S. aberti,* is a consistent and outstanding performance and one difficult to determine whether instinctive or an act of intelligence. The following account is based on facts mainly obtained at Boulder, where the wasp first received my attentions.

S. aberti was found at Owens Lake, a few miles east of Boulder, where it appeared to react most favourably for nesting to flat, dry, open areas, nearly free from vegetation. One such area was studied in much detail. All of the nests were in hard soil in which, nevertheless, there was much gravel, with an occasional rock on or beneath the surface. The wasp was most active while the sun was bright and warm and when its rays reflected with great intensity from the surface. She was difficult to find abroad early in the morning and late in the afternoon, or on cool or cloudy days. During much of the inactive period and at night, both the male and female assume the sleeping positions described for certain digger wasps by Banks (2), Raus (8), and others.

The nest is first dug or constructed and later provisioned. This is in contrast to the habit of capturing a prey and later digging a cell for its reception, a method followed by the digger wasp, *Podalonia luctuosa** (Sm.) (5). The former, it would seem, is a more specialized habit, although in the case of *S. aberti* it is almost a necessity. This is brought about by the habit she follows

*Kindly determined by Professor H. T. Fernald.

**P. luctuosa* is in reality an entirely black color variety of *P. violaceipennis* according to Dr. Fernald and therefore a synonym of it.

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of providing several prey as food for the young of a given cell. *P. violaceipennis* form *luctuosa* habitually takes but one.

Before excavations start, the wasp spends some time in finding a suitable place. A survey is made, partly while the wasp is on the wing and in part on foot, over the surface of the area at hand. When a spot meets her demands, she first uses her jaws to tear away the hard crust and to start the tunnel. The refuse is at first deposited near but later is carried away and ejected much further from the entrance to the tunnel. The work well under way, the insect carries the soil, load by load, on the wing to a rather definite place. The distance the material is carried varies from a few inches to as far as five feet but remains fairly constant for a given individual.

One worker, transporting soil the maximum distance and to the west, during one and one-half hours observation only varied the point of disposal by one or two inches at the most, north or south of the chosen spot. Releasing a load she would immediately fly back for another. At this and other tasks she displays a restlessness, an almost ceaseless activity, although she can be provokingly lazy if the weather be cool or very cloudy.

If the wasp were to work continuously, she might be able to complete the excavation of a nest in this type of soil within two or three hours duration. But she must find the work fatiguing or has other interests elsewhere, for she appears seldom to finish one at a single period of work. She may have another nest or nests which require her time or attention; she may feel inclined to rest or feed; or she may follow this procedure as an instinctive method of precaution, being safer if not found at a given place too long at any one time.

If a wasp abandons a nest for all time, before it is finished, she almost always fills it in loosely with pebbles and soil and smooths the area about and above it. She leaves little trace of her previous activity although the work is hastily executed in comparison with the time and attention given to it when she intends to return.

The tunnel or partially completed nest, if temporarily forsaken, is blocked at the entrance with one or more (usually either one or two) pebbles, small stones, or other suitable objects, just large enough to fit the diameter but too large to fall below to the end of the shaft or cell. The distance above is filled with soil which, sometimes packed, completes the outer barricade. In this packing the wasp may even avail herself of a pebble and use it as a tool for pounding the soil. Although the tool is used for a much shorter time than later, it is still employed sufficiently to pack the soil above, and often for some distance around the tunnel, before she leaves.

When the nest is complete, with the exception of provisioning, she works after the following manner. Pebbles are selected which fit snugly the diameter of the tunnel. These are placed where they rest a few millimeters beneath the surface. The short space above is then filled with soil, scraped loose from the surface with the wasp's mandibles and carried to the nest with them or kicked in with her fore feet. Then with a pebble she pounds in the material before obtaining more. She thus alternates by securing fresh material and then by tamping it. This follows until she has finished, after which the sur-

face is usually scraped smooth and even to a distance of from two to five inches away.

As soon as the wasp has finished the nest, plugged the orifice, and concealed the location of the entrance, she flies away. This flight is often swift and direct and she may soon be lost to view in the distance. If she flies to a flower it is but for a brief visit followed by an erratic flight. She eventually, unless disaster overtakes her, provisions an unfinished cell or begins a new one.

The wasp at Boulder, provisioned her cell with from five to seven or eight green moth larvae. These appeared to be Geometrids but the species taken were not identified. They were captured over a period sometimes as long as seven days. This allowed the egg, which is placed on the side of the first prey to be stored, to sometimes hatch and even develop into a large larva before the final victim had been placed before it. During provisioning the female is often away from the nest for such long periods of time that one can but conjecture what she may be doing. This does not mean, however, that she never provisions a nest quickly for in some instances she has been found to do so.

There is evidence to show that she may have more than one nest under construction and provisioning at the same time. A previous reference has been given elsewhere (3) but credited to *S. varipes*. This would help account for certain long absences away from a given nest. Individuals have been marked so their identity might be sure and the evidence in this respect reliable. The data, however, are too bulky to present here.

During the time the wasp is away from the nest between one visit and the next, or between the capture of one prey and the following, the entrance is plugged or the nest protected in the general manner just described. It is hastily executed in comparison with the time and attention given to the final closure, yet it cannot be spoken of as superficially performed. The pebble is used as a tool but not for so long as at a later time.

The work at the end of nest provisioning finds the wasp using the pebble at her best. I have witnessed this phase of nesting more than a score of times and it is, in general, quite similarly followed by different individuals of the species. Some spend more time than others on the tamping but each do the task well. They compel the admiration of any who may be so fortunate as to observe them. One found late in August seems to be fairly typical and the following account is based on her activities.

The last lepidopterous larva had been brought as food for the young of the wasp, making complete its stock of provisions and allowing the entrance to be sealed. But the wasp does not do this, as a rule, until after a final inspection of the condition of the nest. This usually results in the wasp making several trips within and in the removal of any fine, dry soil, small pebbles, or debris, which may have been brushed inside. The trips this time numbered ten. The dry earth was carried two feet away and released while the wasp was flying. She would then return in the same manner for more.

During this work she did a peculiar thing. It occurred after the fourth and again following the tenth trip. After each of these journeys of soil depositing, she did not return at once or directly to the nest. Instead, she flew

to a willow plant growing nearby. Here, she scraped her mandibles along the leaves in the manner of removing something from them, spending nearly 50 seconds each time in this activity.

She likewise made a noise while at the plants, similar to that commonly produced by the species while using the jaws in excavating. The purpose of her visit to the leaves and the use of her jaws while there has not been satisfactorily explained. It has been observed a few times in other individuals but has not always been practised by each nesting female. The scarcity or abundance of suitable plants near may be a contributing factor.

She first began to close the orifice of the tunnel with a large pebble carefully selected. It fitted snugly the diameter of the tunnel and was placed a few millimeters below the surface of the soil. Next, a second pebble was added above the first. It served a like purpose and increased the support. She was now able to place loose soil upon it without any falling to the end of the shaft. This she did by employing her fore legs, somewhat dog-fashion, to scrape in above the pebbles a quantity of loose soil.

The next pebble selected was smaller and was used as a hammer. It was raised and lowered with much effectiveness in pounding in the filler. Sometimes the wasp vibrated it in place between the hammer-like strokes. At this time her body was nearly vertical in position, with the tip of her abdomen pointed toward the sky. This gave her the somewhat ludicrous appearance of standing on her head. After the tool had been used for forty-five seconds, the wasp left it in the depression where it had been last employed. It was then covered with loose soil.

She soon selected another pebble from the surface at a distance of one-half foot from the nest. It was carried in her jaws as had been done the others. This one was also left, after a minute of use, in the hole. It was forced well into the center after first being lightly covered. It should be mentioned at this point that the combined use of the pebble as a tool and as a filler is not a habitual act. It is believed that in this instance, the female deviated slightly from the average.

The soil immediately about the nest was quite hard, with little loose material at hand so the wasp, in order to help secure further soil, had to bite chunks away from the edge of the walls with her jaws. A small quantity was obtained in this manner and fell within the cavity. She then moved out much farther from the nest than she had done previously and began scraping loose soil and sand towards the hole as she moved backward. Then flying two feet away, she walked about testing the size and shapes of various pebbles, rejecting many before she at last accepted one. It was large and was used to tamp with, much after the fashion of a farmer tamping the ground about a post hole. One difference, already noted, was a frequent vibration in place after the down stroke.

This process and sequence was repeated again and again, the pebble used as a tool continuing no longer to be left in the tunnel but carried to one side, discarded or merely left while she scraped in more filler. She spent twenty minutes in all at this work with "time out" for a brief period a number of times while she rested for a few seconds or visited the willows. A comparison

of the many observations of this phase of the work show a surprisingly close similarity. The minor variations are many but the major purpose is carried out much in the same manner.

When the ground was nearly level at the former nest entrance and while the wasp was yet working, it seemed advisable to take her for identification. The nest was dug out, containing seven moth larvae with a single attached egg. The egg, oblong in shape and attached to the side of the prey farthest from the outside (first to be deposited by the wasp) and its whiteness contrasting with the bright green color of the prey, measured 4 mm. in length and one mm. in thickness through the middle. In this instance, the egg had not yet hatched; in many others, the egg has already hatched and a sturdy wasp larva has been found in its place.

The dimensions of the complete nest vary somewhat, although conforming to a specific plan. One measured, presented a tunnel 6 mm. in diameter with a plug of pebbles and soil 9 mm. in length blocking the entrance. The empty tunnel extended below 42 mm. straight into the earth before it deviated sharply and enlarged into a cell. This cell was quite long, measuring 35 mm. from the opening to the further end and was spacious enough to hold a plentiful supply of provisions.

Due to the fact that wasp larvae did not develop well in the laboratory at Boulder, the exact length of life of the various stages of development were not accurately ascertained. The several failures are believed to have been caused by injuries to the eggs or larvae in the field, or from too dry an atmosphere in the laboratory. But in the field as early as eighteen days (this period is doubtless much too long under some weather conditions) after the final closing of a nest, the cell contained a wasp cocoon. This would normally remain in the fall for several months, or until the warm weather and other conditions of spring would stimulate the pupation and emergence of the insect.

The females nest solitarily and dislike to be bothered in their work. They dig their nests during the entire month of August and late into September. There is also a spring or early summer brood, judging from the content of marked nests. These nests, located in the late summer or early fall, were excavated successively during the late fall, winter and spring and certain facts in regard to the condition of the nest and the development of the wasp obtained. In the winter the cocoons were found covered with moisture or, at certain periods, surrounded by frozen soil. The walls of the cocoons protected the larvae from the former but the cold must have surely penetrated within and numbed them completely. By the last of June many larvae had transformed into pupae, indicating the earlier generation.

Interesting data concerning the length of time the prey may survive, if not eaten by the wasp larva or parasites, was obtained from a nest found on August 25th. On this date the wasp was found filling the tunnel for the last time. She accomplished this in a typical manner, using a pebble as a tool. The nest was dug in to, from the side, on August 31st and a small wasp larva was found which had entirely eaten one of the larvae stored as prey and had partially eaten another. The nest was then sealed and not opened again until September 28th when it was found that the wasp larva had died in the mean-

time. But within were found two of the prey still feebly alive and in good condition, well preserved. This showed that the two moth larvae had remained alive for at least 34 days, a rather long period when we consider the proximity of the nest to the surface and the weather conditions of this season which its inmates of necessity withstood.

Troublesome pests or parasites frequently follow this wasp about in an often successful attempt to appropriate her food and destroy her young. A very common and persistent one is a fly, *Hilarella hilarella** (Zett.), which deposits living young in the nest. Mention of this fly has been recently made by Newcomer (7) and its association with the digger wasp, *P. luctuosa*.

These flies, numbering from one to three or four at a time, followed *S. aberti* about in the field as she carried her prey to the nest, often keeping at a certain rather definite distance, moving to the right as she moved, changing their path to suit hers and ever awaiting the moment and opportunity to deposit their young. This persistence becomes active aggression when the wasp has reached the nest and while she is pulling the prey in after her. These flies sometimes even remain while she is busy bolting the entrance.

This wasp has been seen on several occasions to walk out or fly at these little insects but they are very impudent and return almost as quickly as she, after having been driven away. She does not usually dart at them very excitedly or actively and the flies, apparently sensing little to fear from her feeble attacks return at once to continue their vigil.

One instance was met with in which the fly was stalking the wasp, although the wasp had no prey. A few other examples of such behavior have been observed in the study of other species of nesting wasps. It seems possible that the fly may be following her, on such occasions, attracted by the lingering scent of a former prey, although it may be due to another sense (such as visual stimulation) or some other more complex association.

Fly puparia were secured from marked wasp's nests and showed that the fly maggots had lived on the food provided for the young wasp and had caused its destruction. The number of puparia from a given nest has varied from one to five. There is, however, evidence that the maggots sometimes migrate a short distance into the soil before pupation and therefore this number may be too small. The evidence from the nests seems to indicate that the food was seldom, if ever, completely devoured by the flies. The difficulties the fly encounters in getting to the prey while the wasp is storing it may in part account for this. Another fly, common in the nesting territory of this wasp was *Metopia leucocephala* Rossi.

Chrysidid parasites persisted in remaining near and entering the tunnels of the nest of this wasp. Whether they are usually very destructive to her is doubtful but in these instances their actions were such as to leave little room for doubt as to their intentions and their numbers were sufficent to strongly constitute a menace. The species most commonly found was *Chrysis* (*Holochrysis*) *perpulchra** (Cress.).

*Kindly determined by Dr. J. M. Aldrich.

This cuckoo wasp did not follow *S. aberti* as did the flies but seemed to locate the nests mainly from the discarded soil or nest droppings. This was sometimes accomplished while the wasp was away and the habit has enabled the writer to locate the near proximity of a nesting wasp, although the digger herself did not show up for an hour later. The attempt of *C. perpulchra* to enter the nest of *S. aberti* is more active, in a way, than is that of the fly, *H. hilarella*. This is shown in the following brief account.

On August 23, 1926 several Chrysidids were about nests of this wasp. The largest number at a given time and nest was four, with one or two the more usual. One individual was first seen on the ground where the wasp had previously deposited excavated soil and reached the nest by hoppings and short flights. Having reached the nest, it began kicking back the soil with its fore feet, after the manner of some digger wasps. While using its fore members for this purpose (the mid and hind legs were used mainly for support), the antennae were actively vibrating, moving about and touching the soil.

After a short time the soil was removed and the Chrysidid came to the pebbles filling the diameter and neck of the tunnel. The first one encountered was loosed by the mandibles after which it was pushed up and out with the feet, assisted by the body. At this time and others while using the jaws it made the buzzing sound characteristic of wasps engaged in a like activity. In an atttempt to remove the second stone, the movement freed the barrier which fell into the hole allowing the Chrysidid to enter. It stayed within for almost a minute and was taken upon leaving. A beautiful little species, *Chrysis* (*Holochrysis*) *pacifica** Say, or an unnamed variety very close to it, has been observed at a like errand and making a forced entrance into a nest of *S. breviceps*** (Sm.) in California.

BIBLIOGRAPHY

(1). Allan, H. W. "North American species of two-winged flies belonging to the Tribe Miltogrammini." Proc. U. S. Nat. Mus. Vol. 68, pp. 1-106. 1926.

(2). Banks, N. "Sleeping habits of certain hymenoptera". Journ. N. Y. Ent. Soc. Vol. 10, pp. 209-214. 1902.

(3). Custer, C. P. and Hicks, C.H. "Nesting habits of some Anthidiine bees". Biol. Bull. Vol. 52, pp. 258-277. 1927.

(4). Fernald, H. T. "Notes on some American Sphecinae". Ann. Ent. Soc. Amer. Vol. 24, pp. 439-450. 1931.

(5). Fernald, H. T. "On color dimorphism in *Podalonia violaceipennis*". Canad. Ent. Vol. 62, pp. 278, 279. 1931.

(6). Kellogg, V. L. "American insects". Third edition. pp. 493, 494.

(7). Newcomer, E. J. "Notes on the habits of a digger wasp and its inquiline flies". Ann. Ent. Soc. Amer. Vol. 23, pp. 552-563. 1930.

(8). Rau, P. and N. "The sleep of insects, an ecological study." Ann. Ent. Soc. Amer. Vol. 9, pp. 227-274. 1916.

(9). Williston, S. W. "Notes on the habits of Ammophila." Ent. News. Vol. 3, pp. 85, 86. 1892.

* Kindly determined by Dr. Leland H. Taylor.
**Determined by Professor H. T. Fernald.

A SECOND REPORT ON HEMIPTERA FROM THE NORTH SHORE OF THE GULF OF ST. LAWRENCE*

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In a recent number of the "Canadian Entomologist" (LXII, 75, 1930) the writer reported on a collection of Heteroptera made on the north shore of the Gulf of St. Lawrence during the summer of 1929, by Mr. W. J. Brown. From collections made in the same region during 1930, fifteen additional species were obtained. These additions are given below following which is a complete list of Homoptera obtained during the two summers, 1929 and 1930. All localities cited are within the Province of Quebec.

Heteroptera

CYDNIDAE

Corimelaena anthracina Uhl.—Thunder River, June 16.

Sehirus cinctus (P. B.)—Thunder River, Aug. 25.

LYGAEIDAE

Nysius groenlandicus (Zett.)—Bradore Bay, July 4. This species was previously reported from Greenland, Labrador, Hudson Bay Territory and Alaska. Four specimens were obtained at Bradore. They resemble *ericae* (Schill.) and *thymi* (Wolff) but may be distinguished by the longer basal segment of the rostrum, which in *groenlandicus* exceeds the posterior limits of the bucculae.

Scolopostethus thompsoni Reut.—Thunder River, June 23, 28.

Geocoris bullatus Say—Bradore Bay, July 6, Aug. 2; Natashquan, July 23; Thunder River, Aug. 20-21. Plentiful.

Ligyrocoris sylvestris (Linn.)—Thunder River, Aug. 15-26.

Ligyrocoris diffusus (Uhl.)—Thunder River, Aug. 18-26.

NABIDAE

Nabis ferus Linn.—Bradore Bay, July 9; Thunder River, Aug. 18-26.

MIRIDAE

Miris ferrugatus Fall—Thunder River, Aug. 21. One macropterous male which in form, size and general color approximates the common *dolobratus* (Linn.). The antennae, particularly the second segment are distinctly shorter in *ferrugatus*. The legs are pale, spotted with brownish, not wholly black as in mature males of *dolobratus*.

Chlamydatus pulicarius (Fall)—Bradore Bay, July 29, Aug. 9-12; Thunder River, Aug. 15.

Chlamydatus wilkinsoni D. & S.—Bradore Bay, Aug. 2, 8. A series of brachypterous males of this hitherto unreported European species was obtained. To Dr. H. H. Knight to whom I submitted specimens I am indebted for confirming my determination. This species is admirably described and figured by Reuter (Hem. Gymn. Europ. I, p. 65, Tab. IV, figs. 1, 2).

Mecomma ambulans (Fall)—Bradore Bay, Aug. 2-9. Thirty-seven macropterous males and twenty-one brachypterous females obtained. Dr. H. H. Knight to whom I submitted specimens of *ambulans* for verification writes "I have compared your specimens of *Mecomma ambulans* (Fall) with European

*Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

examples and would pronounce them the same species. There seems to be a slight difference in antennae but nothing more than variations I have seen in other widely distributed species. In fact I note as much difference between the two female examples that you sent."

As far as I am aware this constitutes the first authentic record of *ambulans* from America. In the Palaearctic region it has a wide range throughout Great Britain and northern Europe and has been reported from Siberia. In Europe the adults have been found living among rushes and low grass. Reuter (1883) reports it from *Aspidium filix-femina* and *Polypodium dryopteris* while Butler (1923) found it in England, among ferns and at the roots of rushes.

In the male sex the species closely resembles *gilvipes* Stal. which is also known from the Quebec localities, Bradore Bay, Trinity Bay and Thunder River. The females of *ambulans* have black elytra with the first two antennals wholly black, the second noticeably shorter than in females of *gilvipes*.

GERRIDAE

Gerris pingreensis Drake and Hottes—Thunder River, June 19, Aug. 19-25; Bradore Bay, Aug. 8-12. Twenty-eight specimens, all wingless.

CORIXIDAE

Arctocorixa penniensis Hungfd.—Natashquan, June 21, 1929; Thunder River, June 12, Aug. 19-26, 1930. Twenty-one specimens. The single female from Natashquan, identified as *Arctocorixa* sp. in my previous list, falls here. I have been able to compare it and my Thunder River specimens with a pair of paratypes furnished me through the kindness of Dr. H. B. Hungerford.

Arctocorixa minorella Hungfd.—Natashquan, July 3, 1929; Thunder River, Aug. 28, 1930. Two specimens. The female from Natashquan previously determined as *Arctocorixa* sp. matches the single Thunder River male which I have identified as *minorella*.

Homoptera

CERCOPIDAE

Philaenus lineatus (Linn.)—Thunder River, Aug. 15-18, 1930.

CICADELLIDAE

Oncopsis variabilis (Fitch)—Natashquan, Aug. 3-9, 1929; Trinity Bay, Aug. 17, 1929.

Oncopsis pruni (Prov.)—Natashquan, Aug. 3-9, 1929.

Oncopsis pruni var.—Natashquan, Aug. 8, 1929.

Draeculacephala manitobana Ball.—Natashquan, July 25, 1930; Thunder River, Aug. 18-21, 1930.

Draeculacephala crassicornis Van D.—Thunder River, Aug. 18, 1930.

Gyponana octolineata Say—Trinity Bay, Aug. 22, 1929.

Stroggylocephalus agrestis (Fall)—Lake Isl., June 28, 1929.

Deltocephalus abdominalis (Fabr.)—Thunder River, June 23, 1929; Bradore Bay, July 19, 1929; July 16-Aug. 9, 1930; Natashquan, Aug. 5, 1929, July 25, 1930. Plentiful.

Deltocephalus inimicus Say—Natashquan, Aug. 5-7, 1929; Bradore Bay, Aug. 8, 1930; Thunder River, Aug. 19-26, 1930. Common.

Deltocephalus misellus Ball.—Natashquan, Aug. 1-7, 1929; July 23-25, 1930.

Deltocephalus canadensis De Long—Bradore Bay, July 29-Aug. 8, 1930.

Deltocephalus nigriventer Sand. and De Long—Natashquan, July 23, 1930; Thunder River, Aug. 20, 1930.

Deltocephalus striatus (Linn.)—Bradore Bay, July 29-Aug. 8, 1930.

Deltocephalus sobrinus DeL. and Sleesman—Thunder River, Aug. 18, 1930. In 1929 (Ann. Ent. Soc. Am. XXII, p. 100) De Long and Sleesman described *Latalus ocellaris* var. *sobrinus* from female specimens from Slave Lake, Alta., pointing out that their variety probably represented a species distinct from the European *ocellaris*. My female specimen agrees with *sobrinus* while the male which I associate with it differs distinctly in male genitalia from *ocellaris* Fall as figured by the above authors, so that I have no hesitation in pronouncing *sobrinus* a distinct species. I have also seen other examples of *sobrinus* from Aweme, Manitoba and British Columbia; these agree with my Thunder River pair.

Ophiola arctostaphyli (Ball)—Bradore Bay, July 29, 1930.

Ophiola cornicula (Marshall)—Bradore Bay, July 24, 1929.

Euscelis deceptus Sand. and De Long—Bradore Bay, Aug. 2-9, 1930.

Phlepsius apertus Van D.—Natashquan, July 25-Aug. 7, 1930; Trinity Bay, Aug. 17, 1929.

Thamnotettix ciliatus Osb.—Bradore Bay, Aug. 8-9, 1930.

Thamnotettix belli (Uhl.) var.—Thunder River, June 11, 1929; Mascanin, June 19, 1929. In the three specimens at hand the posterior half of the pronotum is not noticeably paler as in typical *belli*.

Thamnotettix decipiens Prov.—Bradore Bay, Aug. 2-9, 1930; Thunder River, Aug. 18, 1930.

Thamnotettix sp. near *cockerelli* Ball.—Thunder River, Aug. 21, 1930. One male which agrees with Ball's description but has the vertex a little more strongly produced.

Thamnotettix sp.—Trinity Bay, Aug. 18, 1929. One male and two females belonging to the group having the female segment excavated, with a strong blunt median tooth.

Cicadula laeta (Uhl.)—Bradore Bay, July 19-27, 1929, July 16-Aug. 8, 1930. The majority of my specimens are considerably darker with heavier maculation on the front, pronotum, wing veins and legs, than a series from Nordegg, Alta. in the National Collection.

Cicadula variata (Fallen)—Trinity Bay, Aug. 20, 1929.

Cicadula sp. near *variata* (Fallen)—Trinity Bay, Aug. 17-20, 1929.

Cicadula arcuata G. & B.—Natashquan, July 23, 1930.

Cicadula sexnotata (Fallen)—Bradore Bay, July 16-Aug. 9, 1930, July 27, 1929; Natashquan, July 19-23, 1930, Aug. 8-9, 1929. Plentiful at all the above stations.

Cicadula sp.—Natashquan, Aug. 7, 1929.

Balclutha osborni Van D.—Natashquan, Aug. 1-7, 1929; Thunder River, June 23, 1930.

Balclutha impicta Van D.—Thunder River, June 13, Aug. 26, 1930.

Empoasca atrolabes Gill.—Trinity Bay, Aug. 18-20, 1929.

Empoasca trilobata De Long—Trinity Bay, Aug. 18, 1929.

Empoa commissuralis (Stal.)—Trinity Bay, Aug. 20, 1929. This species was described from Sitka, Alaska and recorded from Van Buren and Orono, Me. (Osburn, 1915). I have compared my specimens with examples from Vancouver Isl., B. C. and can find no differences.

Empoa querci Fitch—Trinity Bay, Aug. 20, 1929.

FULGORIDAE

Cixius coloepium Fitch—Trinity Bay, Aug. 17-29, 1929.

Pissonotus sp. near *delicatus* Van D.—Thunder River, Aug. 15, 1930.

Laccocera sp.—Thunder River, June 28, 1930.

Liburnia pellucida (Fabr.)—Harrington Harb., July 4, 1929; Tabatiere, July 11, 1929; Bonne Esperance, July 14, 1929; Natashquan, July 19-Aug. 1, 1929; Little Mecatina Isl., July 6, 1929; Mecatina Sanctuary, July 8, 1929; Thunder River, June 13-19, 1930; Bradore Bay, July 16-24, 1930. Both long and short winged examples present. There is a considerable variation in size and color in my series. The male genitalia of a number of specimens have been examined and found to agree with Metcalf's figure of *pellucida* (Jl. Elisha Mitch. Soc., XXXVIII, pl. 70, fig. 695, 1930).

Liburnia sp.—Bradore Bay, July 16, 1930.

CHERMIDAE

Aphalara veaziei Patch.—Bradore Bay, July 19, 1929, July 4-16, 1930.

Aphalara nebulosa kincaidi Ashm.—Harrington Harb., July 4, 1929; Bradore Bay, July 19, 1929, July 4, 1930. *Kincaidi* was described as a distinct species from Metlakatla, Popof Isl. and Fox Point, Alaska, but has been treated by subsequent authors as a variety of the European *nebulosa*. The variety *americana* Crawford (1911) described from Colorado, is also considered a synonym of *kincaidi* (*vide* Crawford 1914). My Quebec males agree well in genitalia with Ashmead's and Crawford's figures. The wings are distinctly maculate in both sexes while the males have the vertex heavily infuscate with only the ocelli and a small median spot pale.

Trioza sp.—Thunder River, June 11, 1929; Mingan, June 13, 1929; Mascanin, June 20, 1929; Harrington Harb., July 4, 1929; Bradore Bay, July 11, 1930.

Psylla sp. near *pyricola* Forst.—Seven Isl., June 8, 1929; Thunder River, June 11, 1929; Quarry Isl. Mingan, June 13, 1929; Bradore Bay, July 4, 1930.

Psylla sp.—Natashquan, Aug. 3, 1929.

TWO NEW BEES OF THE GENUS ANDRENA FROM CANADA

BY T. D. A. COCKERELL,
Boulder, Colorado.

The Canadian bees now described were received from Mr. Albert F. Winn; the types are in my possession.

Andrena lucifera n. sp.

♀. Length about 9 mm., expanse 18; black, including mandibles and legs, the antennae black with the flagellum thickened and faintly brownish beneath beyond the base; pubescence of head and thorax very scanty,

dull white, the thorax almost nude above, the sparse hair easily deciduous; head broad, facial quadrangle conspicuously broader than long; mandibles ordinary, malar space linear; process of labrum very large, obtusely triangular, shining; clypeus wholly dull, with a minutely granular surface, and sparse punctures; no smooth line, though the middle is slightly elevated: on each side above the clypeus, from the antennae to the orbits, is a broad highly polished area, but the supraclypeal area and middle of front are dull; facial foveae moderately broad, with shining white tomentum; distance from upper end of fovea to lateral ocellus about or nearly as great as width of fovea; below the foveae extend (with approximately even width) below level of antennae, and are separated from orbits by a shining line; cheeks shining, convex, very broad, the upper part strongly keeled behind; third antennal joint fully as long as 4+5; mesothorax dullish, more shining posteriorly, without evident punctures under a lens, but the microscope shows a minutely tessellated surface and scattered small punctures; scutellum polished, with a median impressed line; mesopleura glistening, rugulose, the lower part produced into a sort of tubercle, and the shining anterior face of lower part having a triangular outline; metathorax dull and granular, but the large basal area triangular, with numerous conspicuous plicae, radiating at sides and a few stronger ones in middle; tegulae reddish brown, anteriorly blackened; wings conspicuously reddish, stigma dark reddish brown, the middle darker than the margins, veins brown; basal nervure falling well short of nervulus; second cubital cell narrow, much higher than broad, receiving recurrent nervure not far from end; legs with pale brown hair, the hind tibial scopa wholly pale, faintly reddish, the hairs on outer side simple; spurs normal, pale reddish; abdomen broad, highly polished, nude above, without bands, the hind margins of the tergites obscurely brownish; under a lens no distinct punctures are visible, but the microscope shows sparse minute punctures; apical depression of first tergite short, of second less than half distance from base to apex, but rather more than two-fifths; apical fimbria pale brown; venter with dull whitish hair.

Quebec; Montreal, 2 taken June 26, 1927 (*J. W. Buckle*).

A very distinct species, by reason of the dark stigma, tuberculate pleura plicate area of metathorax, peculiar sculpture, etc. In spite of the metathorax, it is not a *Trachandrena,* but rather falls in Viereck's *Gonandrena,* though easily separated from *A* (*G*) *persimulata* Vier. by the dark stigma and other features. I have *A. persimulata* from Ottawa, but also a pair from Milwaukee, Wisc. (the type locality), sent by Dr. Graenicher as *A. platyparia* Rob. The species is, in fact, very like *A. platyparia,* which has been regarded as identical with *A. fragilis* Smith. I compared Smith's type of *fragilis* with *platyparia* and reported (1906) that *fragilis* (male) had the hind tarsi and hair at apex of abdomen redder, "but there was no essential difference." Morice had earlier examined the type of *A. fragilis* and noted (1901) that it might well be the male of *A. integra* Smith; "area similarly strigose, and abdomen also corresponds; tubercle matches also!" I examined the type of *A. integra* (female) and found it identical with what Viereck sent me as *A. lineata* Provancher. The stigma was dark ferrugineous, and the facial foveae were narrow, strongly marked, and

yellowish white. Viereck in his Connecticut table runs female *A. fragilis* and *A. integra* to the same place separating them thus:

Process of labrum quadrate or nearly so and margined - - - - - - - - *fragilis*
Process of labrum rounded, not margined - - - - - - - - - - - - - - - - *integra*

In the table of males he has only *A. fragilis,* distinguished by the cheeks keeled behind, and third antennal joint longer than fourth, but shorter than fourth and fifth combined. He gives *A. platyparia* Rob., *A. laticeps* Prov., and *A. provancheri* D. T. as synonyms of *A. fragilis.* Morice described the tubercle (process of labrum) of the type of *A. integra* as "roundly truncate"; area of metathorax obliquely strigose. What I have as *A. platyparia* (from Maine (Lovell) has the process of labrum rounded, and appears to be *A. integra.* It now appears probable that *A. fragilis* and *A. integra* are the sexes of one species, as Morice supposed; whether *A. platyparia* is really a different species, I cannot now determine, having no authentic material. I conclude that the subgenus *Tropandrena* Viereck, 1924 (type *A. fragilis*) is not to be separated from *Gonandrena* Viereck, 1917, (type *A. persimilata*).

Andrena (Micrandrena) vagans n. sp.

♀. Length about 6 mm.; similar to *A. fragariana* Graenicher, but differing thus; antennae entirely dark; facial foveae whiter and conspicuously broader; head larger; base of metathorax more distinctly sculptured. The stigma is clear bright ferrugineous (pale yellowish in *fragariana*).

Colorado: Boulder, 1925 (*Norma LaVeque*). Type locality.

Quebec: Montreal, May 17, 1927 (*Buckle*); Lanoraie, June 24, 1927 (*Buckle*).

It differs from *A. melanochroa* Ckll by the smaller size, white facial foveae, redder tegulae, and creamy white instead of reddish hair on inner side of hind tarsi. *A pacifica* Ashmead (Alameda Co. Calif.), the type of *Micrandrena,* is, I believe, a synonym of *A. melanochroa.*

The following key will facilitate the recognition of the species of *Micrandrena,*

1. Females .....2.
   Males .....7.
2. Larger, about 7.5 mm. long; facial foveae brownish.....3.
   Smaller, about 6 to 7 mm. long.....4.
3. Larger, with first tergite highly polished (Colorado).....*nigritarsis* V & C.
   Smaller, with first tergite dullish (as it is also in *A. vagans*) *melanochroa* Ckll
4. Clypeus dullish, and without distinct punctures as seen under a lens.....5.
   Clypeus shining, with distinct punctures.....6.
5. "Fovea narrow, clypeus bare, convex, metallic; enclosure rugose; second cubital cell long" (Robertson).....*personata* Rob.
   "Fovea broad: clypeus more pubescent, flatter, not metallic; enclosure less rugose; second cubital cell shorter" (Robertson)
   A greenish species .....*ziziae* Rob.
6. Head larger, face broader, clypeus more shining.....*ziziaeformis* Ckll.
   Head smaller, face narrower, clypeus less shining, mandibles dark.....
   .....*fragariana* Graen.
   Differing from *fragariana* as stated above; the lower part of the clypeus is

polished, not rugose between the punctures, but the upper part (more than half) is rugose; the facial foveae end broadly below level of antennae, but the light tomentum is lacking on lower parts ending abruptly at about level of upper side of antennal sockets.....*vagans* n. sp.

Very small Californian species, with flagellum bright red beneath.....*timberlakei* Ckll.

7. Tegument of face dark.....*fragariana* Graen
(*A. subtilicornis* Viereck, also with dark face in male is a Californian species, 6 mm. long, with ochraceous pubescence, said to be allied to *A. personata*. I have not seen it)

At least clypeus light.....8.

8. Clypeus light yellow, very broad and low, with narrowly extended sides.....*timberlakei* Ckll.

Clypeus high, the upper margin broadly rounded.....9.

9. Antennae shorter; no lateral face-marks.....*ziziae* Rob.

Antennae longer; with lateral face-marks.....*personata* Rob.
(*A. trevoris* Ckll., male 9 mm. long, with yellow clypeus is not a *Micrandrena*).

In Proc. U. S. Nat. Mus., XXXVI, (1909) p. 420, I defined *Micrandrena* as having the basal nervure falling some distance short of the nervulus, and the end of the first intercubitus very near the large stigma. I remarked at the time that on this basis *A. ziziaeformis* is not a true *Micrandrena,* but falls in the group of *A. flavoclypeata* Smith. *A. timberlakei* has the basal nervure falling considerably short of the nervulus, but the first intercubitus is not very near the stigma. The appearance of the male clypeus also shows that it is not a typical *Micrandrena*).

Robertson says that *A. ziziae* sometimes has a dot on each side of face, representing the lateral marks, but in that case the shorter antennae at once separate it from *A. personata*. According to my material *A. ziziae* from Milwaukee, Wisc. (Graenicher) is a good size larger than topotypical material from Illinois.

SOME ERYTHRONEURA (GRAPE LEAF HOPPERS) OF THE MACULATA GROUP. (HOMOPTERA, CICADELLIDAE)

BY R. H. BEAMER,
Department of Entomology, University of Kansas, Lawrence, Kansas.

(continued from page 144)

102. **Erythroneura omani** Beamer.

Erythroneura omani, Beamer, R.H., Jr. Kansas Ento. Soc., April, 1930.

This rather small species was named from specimens taken from apple near Lawrence, Kansas. It has since been taken from the same host near Bentonville Arkansas.

103. **Erythroneura misera** n. sp.

General ground color semihyaline to yellowish white marked with reddish orange. Vertex with semblance of five white spots more or less surrounded with orange bands. Pronotum with median Y-shaped spot and usual angular spot back of each eye which reaches half way to posterior margin. Scutellum with spot at tip, basal angles yellow with orange band on outer mar-

gin. Clavi with usual basal anchor-shaped spot and elongated mark near tip. Coria with spot on costa midway between plaque and base, a more or less disconnected zigzag, irregular-sided vitta arising at anterior end of plaque more or less surrounding it and ending at base of cell M_4. Cross-veins reddish. Black spot in base of cell M_4 and posterior end of plaque. Venter stramineous more or less tinged with red.

Genitalia. Pygofer hook single, of medium length curved in, about parallel-sided for basal half thence tapering to point. Style with medium foot; base slightly curved; heel medium; anterior point short about a right angle; posterior point about as long as toe is wide, broad at base. Oedagus in dorsal view almost quadrangular, appearing like a club-shaped spiny shaft enclosed in a membrane.

Holotype; male, Johnson Co., Ill., March 30, 1929, R. H. Beamer.

Paratypes; 2 males, same data; 1 Plummer's Id., Md., W. L. McAtee.

104. **Erythroneura certa** n. sp.

General ground color semihyaline to yellowish white marked with orange. Vertex with semblance of five white spots more or less surrounded with orange bands. Pronotum with median large more or less heart-shaped spot and usual angular spot back of each eye. Clavi with usual basal anchor-shaped spot which may or may not be divided and spot near tip. Coria with spot on costa midway between plaque and base, another more or less disconnected, irregular-sided vitta arising at anterior end of plaque, surrounding it and ending near base of cell M_4. In the type this last vitta appears indefinite. Cross-veins red. Black spot in base of cell M_4 only. Venter stramineous tinged with pink.

Genitalia. Pygofer hook single, of medium length, almost parallel-sided to outer fourth where it expands slightly then rapidly narrows to a point, inner edge of this portion often has fine teeth. Style with short foot; base curved; heel medium sized but sharply defined; anterior point short about a right angle; posterior point longer than foot, almost parallel-sided. distinctly curved near base. Oedagus very short, spiny, slightly tapering in lateral view to very irregular tip, has appearance of being broken.

Holotype; male, Gallatin Co., Ill., March 30, 1929, P. W. Oman.

Paratypes; 4 males from Cherokee, Co., Kansas, R. H. Beamer; 1 male, Walnut, North Carolina, Beamer.

105. **Erythroneura mirifica** n. sp.

General color semihyaline to yellowish white marked with orange. Vertex with semblance of five white spots thinly margined with orange. Pronotum with median elongated spot usually not reaching either margin, usual angular mark back of each eye. Scutellum with spot on tip, basal angles yellow with small triangular mark in each outer corner. Clavi with usual basal anchor-shaped spot, very thin in middle, and elongated spot near tip. Coria with spot on costa midway between plaque and base, an irregular-sided, more or less disconnected, zigzag vitta arising at anterior end of plaque and ending near base of cell M_4. Cross-veins orange. Black spot in base of cell M_4 and smaller one in posterior end of plaque. Venter stramineous more or less tinged with pink.

Genitalia. Pygofer hook single, almost straight, slightly curved in, widest at base, usually not reaching to tip of pygofer. Style with large foot; base

curved; heel very large and pronounced; outer third of foot narrowed to about width of posterior point with sides almost parallel; almost no anterior point, about a right angle; posterior point longer than foot, almost parallel-sided, slightly curved in. Oedagus of medium length, cylindrical, almost straight.

Holotype; male, Johnson Co., Ill., March 30, 1929, P. W. Oman.

Paratypes; 1 male, each from Wabash Co., Ill.; Natchitoche Parish, La.; Glen Echo, Md.; Clayton Co., Iowa; Ottawa Co., Okla.; Marshall, Arkansas.

106. **Erythroneura ingrata** n. sp.

General ground color semihyaline to yellowish white marked with orange. Vertex with semblance of five white spots bordered with thin orange line. Pronotum with medium rectangular to angular-shaped spot and usual mark back of each eye reaching about half way to posterior margin. Scutellum with spot on tip, basal angles yellow with slight orange mark on outer margin. Clavi with usual basal anchor-shaped spot and elongated one at tip. Coria with small spot on costa midway between plaque and base, another irregular-sided, more or less disconnected, zigzag, vitta arising at anterior end of plaque and ending near base of cell M_4. Cross-veins orange to red. Black spot in base of cell M_4 and another about half as large in posterior end of plaque. Venter stramineous more or less tinged with pink.

Genitalia. Pygofer hook single, long, reaching to or beyond tip of pygofer, enlarging from base almost to middle where it begins to narrow, ending in a rather slender tip. Style with large foot; base curved; heel large; toe narrowed to about width of posterior point; anterior point very short, about a right angle; posterior point as long as or longer than foot, almost parallel-sided and straight. Oedagus of medium length almost straight from any view, cylindrical, ending in a well defined lip.

Holotype; male, Gallatin Co., Ill., March 30, 1929, P. W. Oman.

Paratypes; males, 2, Polk Co., Ark., Beamer; 4, Ottawa Co., Okla., Beamer.

This species may be told from *usitata* Beamer by its more pronounced heel of the foot and by its longer pygofer hook tapering on at least the outer half.

107. **Erythroneura marra** n. sp.

General ground color semihyaline to yellowish white marked with red. Vertex with semblance of five white spots more or less surrounded with red bands, sometimes merely a median red stripe. Pronotum with median triangular spot and usual angular dash back of each eye. Scutellum with large red spot on tip, basal angles yellow with touch of red in each outer corner. Clavi with usual basal anchor-shaped spot reduced to two spots with another near tip. Coria with spot on costa midway between plaque and base, one at anterior end of costa, another opposite middle of plaque, two at posterior end of plaque and an elongated one near base of cell M_4. Cross-veins red. Black spot in base of cell M_4 but lacking in posterior end of plaque. Venter stramineous tinged with pink.

Genitalia. Pygofer hook single, reaching almost to end of pygofer, S-curved. Style with rather small foot; base straight; heel medium; anterior

point short, slightly less than a right angle; posterior point about as long as foot, narrow and sharp pointed. Oedagus long; wide at base, tapering to tip where it widens again to bend dorsally in a very thin hoe-like lip.

Holotype; male, *Allotype* female, 2 male and 1 female *paratypes,* Washington, D. C.

This beautiful red-spotted species resembles *E. hymae* Rob. somewhat externally but is easily separated from it by the very peculiar hoe-shaped oedagus.

108. **Erythroneura aculeata** n. sp.

General ground color semihyaline to yellowish white marked with orange. Vertex with semblance of five white spots more or less surrounded with orange bands, outer basal spots often larger. Pronotum with median rectangular spot usually rather small, angular spot back of each eye long. Scutellum with spot on tip, basal angles yellow often outlined with orange. Clavi with usual basal anchor-shaped spot and long pointed mark at tip. Coria with spot on costa midway between plaque and base, another more or less connected, irregular-sided vitta arising at anterior end of plaque and ending near base of cell M_4, and two longitudinal stripes at posterior end of plaque. Cross-veins orange. Black spot in base of cell M_4, usual one in posterior end of plaque wanting. Venter stramineous more or less tinged with pink.

Genitalia. Pygofer hook single, ending short of pygofer in bifid tip, slightly curved in, outer fork larger, inner projecting in almost at right angles then turning out almost parallel with outer. Style with foot large; base curved; heel very prominent, projecting below base of foot; anterior point short about a right angle; posterior point about as long as foot, narrow, extending at about right angles to foot. Oedagus almost rectangular in dorsal view, quite spiny especially on lateral margins, tip slightly protruding.

Holotype; male, Clayton Co., Iowa, April 19, 1930, R. H. Beamer.

Paratypes; 6 males, same data.

109. **Erythroneura clara** n. sp.

General ground color semihyaline to milky white more or less tinged with yellow in some specimens. Marked with red or orange. Vertex with semblance of five white spots more or less broadly surrounded by red or orange bands. Pronotum with median heart-shaped spot usually not touching either margin. Usual angular mark back of each eye. Scutellum with tip red, basal angles yellow more or less surrounded with red or orange. Clavus with usual anchor-shaped mark and spot at tip. Coria with spot on costa about midway between base and plaque, an angular dash at anterior end of plaque, one opposite middle of plaque, two at posterior end and one on anterior end of Cu. Cross-veins red or orange. Very small black spot in base of cell M_4, none in posterior end of plaque. Venter stramineous more or less tinged with pink.

Genitalia. Pygofer hook single, tapering from base to tip, sharply turned out at tip. Style with medium foot; heel small; base slightly curved; almost no anterior point; posterior point about as long as foot, almost as wide at base as toe. Oedagus almost square composed of a basal sheath-like portion with an inner wedge-shaped portion protruding, more or less covered with spines of various lengths.

Holotype; male, Johnson Co., Ill., March 30, 1929, R. H. Beamer.
Plesiotype; male, Douglas Co., Kansas, May 1, 1928.
Paratypes; 4 males, Polk Co., Ark.; 2 males, Lawrence Co., Ill.; 3 males, Marshall, Ark.; 2, males, Plummer's Id., Md., W. L. McAtee.

110. **Erythroneura inepta** n. sp.

General ground color semihyaline to yellowish white marked with red. Vertex with semblance of five white spots or less surrounded with red bands. Pronotum with small heart-shaped median spot usually not reaching either margin, usual angular mark back of each eye. Scutellum with red spot on tip, basal angles yellow more or less bordered with red. Clavi with basal anchor-shaped spot and oval mark near tip. Coria with dash on costa midway between humeral angle and plaque, a more or less connected, irregular-sided vitta arising on costa at anterior end of plaque and ending on costa at posterior end and another dash on Cu near cross-veins. Cross veins red. Definite black spot in base of cell M_4, smaller one in posterior end of plaque. Venter stramineous more or less tinged with pink.

Genitalia. Pygofer hook single, of medium length, wide throughout most its length, bifid at tip, outer spine short and sharp, inner one long and narrow, proecting in at about right angles to outer; numerous short sharp spines along outer margin back from tip. Style with medium foot; base almost straight; heel medium; anterior point short, broad, slightly less than a right angle; posterior point longer, sharper, about as long as foot is wide at narrowest place. Oedagus of medium length, cylindrical, slightly bent in lateral view.

Holotype; male, Anderson Co., Kansas, Nov. 26, 1927, R. H. Beamer.
Paratypes; males, 1, same data; 1, Gallatin Co., Ill., 3-31-29, P. W. Oman; 2, Manhattan, Kansas, Feb., 21, 1929, D. A. Wilbur; 1, Ames, Iowa, R. H. Beamer; 2, Glen Echo, Md.; 1, Plummer's Id., Md., W. L. McAtee; 1, Tuskahoma, Okla., 5-23-28, R. H. Beamer.

(to be continued)

A EUROPEAN SAWFLY (DIPRION POLYTOMUM (HARTIG) ATTACKING SPRUCE IN THE GASPE PENINSULA, QUE.*

BY R. E. BALCH and L. J. SIMPSON,
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In November, 1930, spruce stands throughout a great deal of the interior of the Gaspe peninsula were found to have been partially defoliated by a sawfly. In some areas the greater part of the foliage had been eaten; about ten cocoons per square foot were found in moss and litter on the ground, beneath the trees.

During 1931, a biological investigation of this outbreak was conducted at a station in the upper waters of the Grand Cascapedia river and surveys were carried on in order to determine the area of the infestation. An airplane survey showed that over 2,000 square miles were infested. The damage has so far been confined to the old foliage of white and black spruce. A great deal of the white spruce, of which there are some very fine stands in this region, has lost practically all of the old foliage and is in a seriously weakened condition. Black spruce is less heavily defoliated. Some six per cent of the trees

*Contribution from Division of Forest Insects, Entomological Branch, Dept. Agric., Ottawa.

have already been killed by the barkbeetle, *Dendroctonus piceaperda* Hopk., which increased considerably in numbers in 1931. There are no previous records of such an outbreak. The insect has been determined by the outbreaks at both the United States National Museum and at the British Museum to be the European species, *Diprion polytomum* Hartig.

Although this species was first described in 1834, and there are a number of references to it in European literature as a defoliator of spruce, it does not seem to have appeared before in such destructive numbers. That it should be first discovered on this continent in the form of a large outbreak throughout the interior of the Gaspe peninsula raises the question as to how it was introduced. It seems to have established itself over a very extensive area before developing into an epidemic. There is no evidence that it entered the country at any point.

No parasites have as yet been found and the chief biotic factor of control seems to be the destruction of the cocoons by shrews and mice. At higher altitudes a number of the larvae were caught by early snows and considerably mortality may result from the shortness of the season. No general reduction of numbers, however, was discovered during the past season and a continuance of the outbreak is to be expected. There has been an unusual overlapping of generations and about seventy-five per cent of last winter's hibernating larvae remained dormant during the summer and are still in the prepupal stage. This probably adds to the likelihood of a continued outbreak.

The larvae, which may be found on the trees from July to September, vary somewhat in colour in the different instars. They gradually turn from pale yellowish to fairly dark green. In the fourth stage, five fine, white, longitudinal stripes appear. In the sixth stage, which hibernates without feeding, these white stripes are missing and the body is marked by one dorso-medial and two dorso-lateral light green stripes on a dark ground. The head is greenish-brown with the eyes almost black.

There is only one generation a year in the Gaspe peninsula. The eggs are laid singly in the needles throughout July and the first part of August, and hatch in about ten days. Hibernation commences in September. It is not known yet whether this year's larvae will produce adults next year or whether they will all carry over in the ground another season.

THE OCCURRENCE OF THE ODD BEETLE AND A BRIEF NOTE ON OTHER DERMESTID SPECIES IN CANADA

BY C. R. TWINN,
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The occurrence in Canada of that unique and interesting species, *Thylodrias contractus* Mots., which Felt (2) has dubbed "the odd beetle", is a matter worthy of note.

This species was first discovered in North America, in May, 1902, by Mrs. Annie Trumbull Slosson, who found the insects in a box of neglected entomological specimens stored in an old closet in her home in New York. She sent specimens to leading coleopterists in the United States and England, all

of whom were impressed by the unusual characters of the species but were unable to identify it. In a paper recording her experiences Mrs. Slosson (6) styled the insect *Ignotus aenigmaticus* without intention of endowing it with a name. The species bore this name, however, for several years, and, in 1908, Mrs. Slosson (7) published a description of the male and female adult, and the larva, prepared by Frederick Blanchard, and accompanied by several excellent drawings. This article came to the attention of Philip Zaitzev, a Russian entomologist, who pointed out (8) that the species already had been described and figured by Motschulsky, in 1839, from Transcaucasia under the name *Thylodrias contractus.*

In 1916, Felt (1) reported the presence of great numbers of the larvae of this species in a house in New York, and expressed the opinion that the species "may possibly become a pest of considerable importance in museums, probably in stored food products and perhaps in dwellings". In 1927, Mutchler and Weiss, in a paper on the dermestid beetles of New Jersey (5), stated that their attention had been called, from time to time, to infestations of the species in collections of insects and other natural history specimens.

In May, 1930, several of the larvae were found at Ottawa, feeding on dried specimens of Oestrid flies, in a small box labelled "A. E. Porsild, Yukon delta, July 18, 1926". We were unaware of the identity of the larvae and placed them in a petri dish with the dried bodies of several moths. The larvae fed readily on the moths, and one (a female) pupated and emerged on June 19. The remainder were still in the larval stage when examined in January, 1931. The petri dish was subsequently misplaced during the process of office moving and was not again examined until January, 1932, when it was found that six adults, one male and five females, had emerged and died, and no living larvae remained. The beetles were then passed to W. J. Brown who kindly determined them as *Thylodrias contractus* Mots.

Both sexes of the odd beetle bear a single ocellus between the compound eyes, and are 2-3 mm. in length, yellowish-brown in colour and thinly clothed with pale hairs. The male is elongate, has long slender antennae and legs, and possesses elytra but no wings. The female is larviform, and has neither wings nor elytra. It is stouter and its antennae and legs are much shorter and weaker than in the male. The larva is a stout brownish grub, somewhat similar in appearance to the larva of the buffalo carpet beetle, but smaller, and lacks the caudal hair tufts of the latter species, and bears on its abdominal dorsum a dense covering of short clavate bristles.

There are eight other species of dermestid beetles in Canada, that feed on animal matter, and are of actual or potential economic importance. These are the larder beetle, *Dermestes lardarius* L.,* a common and widespread household pest especially fond of animal food products; the hide or leather beetle, *Dermestes vulpinus* Fab.* (recorded from Ontario and Quebec), which feeds on meat and other food materials of high protein content; the black carpet beetle, *Attagenus piceus* Oliv.,* a widespread pest of fabrics, furs, other materials of animal origin, and also of cereal products; *Attagenus pellio* L., taken

*For a more detailed account see Gibson and Twinn (4).

in Ontario and Quebec and reared by Fletcher (3) in 1902 from larvae destroying carpets at Wolfeville, Nova Scotia; *Trogoderma versicolor* Creutz.,* received in 1930 from Napanee, Ont., and reared at Ottawa on woollen cloth and cereal products; *Trogoderma ornata* Say, taken at Trenton, Ont., June 7, 1902, and recorded in the United States as occurring in dwellings and occasionally attacking insect collections; the buffalo carpet beetle, *Anthrenus scrophulariae* L.,* a wide-spread pest of carpets, clothing and other materials of animal origin, and the varied carpet beetle, *Anthrenus verbasci* L.,* a species of similar habits received from Toronto in 1928, and reared at Ottawa on cereals and wool.

REFERENCES

1. Felt, E. P., New York Rep. 31, 88, 1916.
2. Felt, E. P., N. Y. Sta. Mus. B. 194, 54, 1917.
3. Fletcher, J., Ann. Rep. Ent. Soc. of Ont., 1902, p. 27.
4. Gibson, Arthur & Twinn, C. R., Can. Dept. Agri. B. 112 (Revised Edit.), 1931.
5. Mutchler A. J., & Weiss, H. B., N. J. Dept. Agri. Circ. 108, 6, 1927.
6. Slosson, A. T., Can. Ent. 35, 183, 1903.
7. Slosson, A. T., ibid, 40, 213, 1908.
8. Zaitzev, P., ibid, 41, 37, 1909.

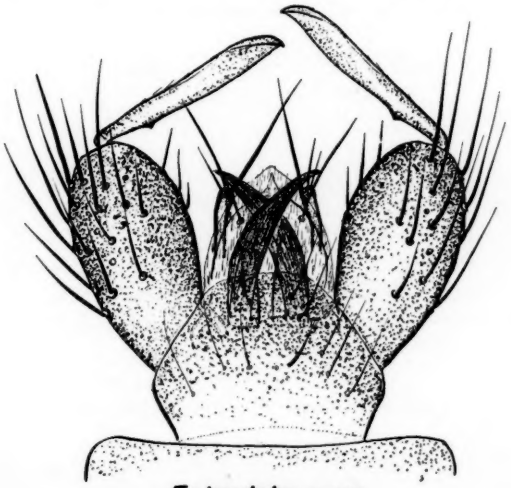
A NEW SPECIES OF FORCIPOMYIA (DIPT.; CHIRONOMIDAE)*

BY G. STUART WALLEY,
Ottawa, Ont.

Forcipomyia simulata n. sp.

Male.—Length 2 mm. Black, shining. Antennal plumes black; basal antennal segment dull black, segments of flagellum brownish.

Thorax black, pleural membranes brownish, dorsum greyish pollinose; scutellum and metanotum dull black with faint pollen. Halteres dark brownish with creamy white knobs. Femora and tibiae brownish with apices of tibiae slightly



F.simulata n.sp.

*Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

paler; tarsi pale yellowish brown. Legs with long hairs. Basal segment of hind tarsus two-thirds as long as second segment. Wings evenly moderately clothed with brownish hairs, without pale spots.

Abdominal tergites blackish with apices narrowly brownish. Hypopygium as in figure.

Holotype—♂, Pembroke, Ontario, Sept. 8, 1931, (F. W. Cockburn); No. 3381 in the Canadian National Collection, Ottawa, Ont. Taken in house in company with numbers of a species of *Sciara*.

Notes—Differs from *specularis* Coq. in form of male genitalia and in having the thorax pollinose. In Malloch's key (Bull. Ill. St. Lab. Nat. Hist., X, Art. VI, p. 312, 1915) it runs to 12 on tarsal and antennal characters but is easily distinguished from *pilosa* and *aurea* on color. In Edward's arrangement of British species (Tr. Ent. Soc. Lond., Pt. II, p. 394, 1926) it falls just beyond the limit of his Group A, having a tarsal ratio of .66.

NOTES ON UTAH HEMIPTERA

BY GEORGE F. KNOWLTON,
Utah Agricultural Experiment Station

Several interesting records of Hemiptera are recorded from Utah in the following short list. The writer is indebted to Mr. H. G. Barber of the National Museum for naming the material.

FAMILY CYDNIDAE (BILLBERG)

Amnestus spinifrons (Say). On beets, Garland, Apr. 21, 1930 (Knowlton).

FAMILY COREIDAE (LEACH)

Alydus conspersus Montd. Logan, Aug. 1, 1931 (Knowlton); Providence, Sept. 28, 1930 (M. J. Janes).

Harmostes reflexulus (Say). On *Lepidium perfoliatum*, Corinne, April 27, 1931, (Knowlton); on *Chrysothamnus* sp. Paradise. 1931 (Knowlton and Janes).

Corizus indentatus Hambl. Logan, July 31, 1906.

FAMILY ARADIDAE (SPINOLA)

Aradus lugubris Fall. Tooele, Aug. 5, 1930 (Knowlton).

FAMILY LYGAEIDAE (SCHILLING)

Nysius californicus Stal. Kosmo, May 24, 1930 (Knowlton).

Ischnorrhynchus resedae (Panz.). Logan Canyon, July 24, 1930 (Knowlton and Janes); Round Valley, Aug. 21, 1925 (Knowlton).

Geocoris uliginosus (Say). On sugar-beets at Roy, June 16, 1930 (Knowlton). Rare compared with *Geocoris decoratus* Uhl.

Scolopostethus thomsoni Reut. Ogden, Aug. 4, 1918 (E. G. Titus).

FAMILY TINGIDIDAE (LAPORTE)

Piesma cinerea (Say). Cornish, July 6, 1930 (Knowlton); on sugar beets, Layton, June 14, 1929 (Knowlton); on *Atriplex* sp., Monument, June 9, 1930 (Knowlton.)

Piesma incisa McAtee. On *Atriplex* sp. at Monument, June 9, 1930 (Knowlton).

FAMILY MIRIDAE (HAHN)

Trigonotylus ruficornis (Geoff.) On clover at Garland, Aug. 12, 1929 (H. J. Pack).

Labops hitus Knight. Providence, June 8, 1930 (Janes).
Philophorus schwarzi Reut. Bush, Aug. 1926 (Knowlton).
Hadronema militaris Uhl. Promontory, June 9, 1930 (Knowlton and Janes).
Orthotylus flavosparsus (Sahlbg.). On Russian thistle, Hardup, Mar. 24, 1930, (Knowlton).
Phyllopidea picta (Uhl.). Cedar Creek, June 9, 1930 (Knowlton and Janes).

FAMILY PHYMATIDAE (LAPORTE)

Phymata pennsylvanica coloradensis Meln. On beets at Corinne, Aug. 6, 1930 (Knowlton); Grantsville, July 24, 1929 (Knowlton); on Russian thistle, Lampo, Aug. 6, 1930 (Knowlton).

VARIATIONS WITHIN THE SPECIES OF THE NEMESTRINID FLY *RHYNCOCEPHALUS SACKENI* WILLISTON

BY KENNETH GRAHAM,
University of British Columbia, Vancouver, B.C.

As I was working over a series of Nemestrinid flies with Curran's key (1), certain variations at once became apparent. The series consists of 93 females of *Rhyncocephalus sackeni* Williston (2), identified by Mr. Curran himself, and it seemed advisable to list the points used in the key and to assign therein the irregularities occurring in the flies, together with some variations in wing venation.

Curran bases the distinction between species *R. sackeni* Williston and *R. subnitens* Cockerell upon "posterior femora and tarsi blackish, style of female black in *sackeni*," and "posterior femora brown, tarsi reddish brown, style of female reddish in *subnitens*". Of these, the black ground colour of the femora is the only constant characteristic of species *sackeni;* the other characteristics vary according to the table below:

Posterior Tarsal segments

All black	30	specimens
The 4 distal segments black	15	"
5th segment and distal part of others black	39	"
Only 5th segment black, others clear or brownish	6	"
All segments clear or brownish	3	"
Total	93	

Antennal styles

Both entirely black	25	specimens
Both black on distal half	46	"
Both black at tip only	19	"
Both clear or brownish	2	"
Total	92	

1. Curran, H.C. Canadian Entomologist, Vol. LXIII, No. 3 pp. 68, March 1931.
2. I am indebted to Professor G.J. Spencer of the University of British Columbia who lent me specimens and suggested listing the variations I discovered.

It may be noted that one specimen was almost a harlequin, possessing the following colour scheme:—The tarsi of both fore legs translucent; of the middle legs the 4 distal segments and distal part of first segment black; of the hind legs all the tarsal segments of the right leg were translucent, of the left leg the four distal segments were black.

In connection with wing venation, out of 91 specimens examined for this feature, all except one had cell R4 of the wings closed; the exception had cell R4 widely open as figured by MacGillivray in his text book of "External Insect-Anatomy." Of the 90 with closed cell R4, two specimens had a cross vein in the cell R4 of the right wing and four specimens had a cross vein in cell R4 of the left wing. In fact, there are many minor variations of this type in the wing venation both in connection with cells and with accessory cross veins. The entire series had cell M_1 (2nd posterior) closed as stressed by Curran.

Unfortunately only one species is represented in the series before me and all are females, therefore I cannot at this time state any differences that might occur between the sexes. From the variations noted above, however, it would seem that the black femora alone are the only features than can be relied upon in this key to separate *sackeni* from *subnitens*.

MAILED SATURDAY, JULY 30TH., 1932

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